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Soil Mycofloral Diversity of Wheat Crop Field of Kota Region

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ABSTRACT

Soil mycoflora are ecologically important for most crops because they benefit plant growth and survival. The present study was conducted with an objective to assess soil fungi diversity in field soil in Kota, Rajasthan, and their role in growth and development of wheat crop. The soil samples from different sites; where wheat crop is grown in Kota region were collected, and fungal species were identified, alongwith spore density calculation. The overall spore density in wheat crop field in Kota region showed that the soil properties were better due to mycoflora or fungal species diversity as compared to field region without fungal diversity. The fungi conservation is the basic aspect of this investigation. Mycoflora provides fertility to soil and improves its quality increasing the yield of wheat (*Triticum aestivum*) crop.

KEYWORDS: *mycoflora, soil, diversity, Kota, wheat, crop, spore, species, fungi, growth, yield*

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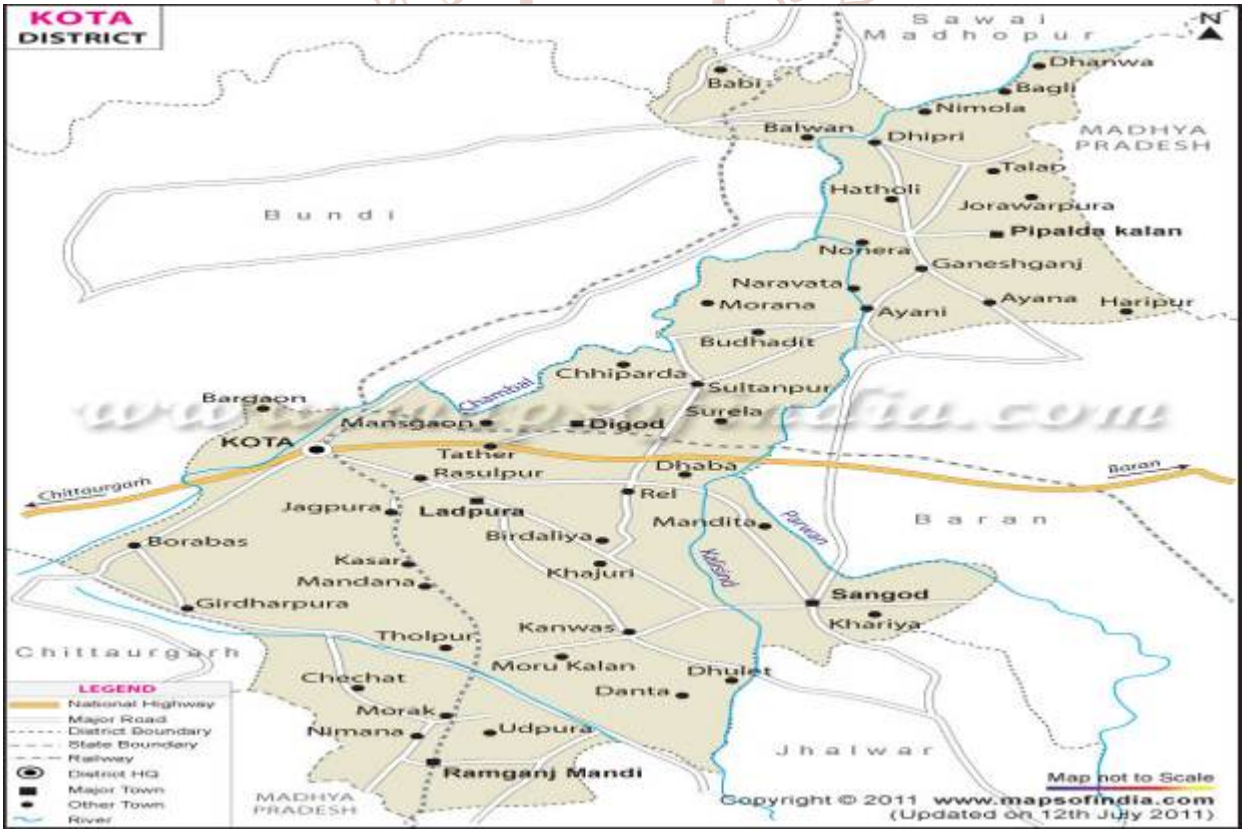
INTRODUCTION

Research was conducted on isolation and identification of soil Mycoflora of wheat fields in Kota region. The soil samples used for the study were collected from different field sites located in Kota where only wheat (*Triticum aestivum*)crop was grown.



The soil sample inoculation was carried was carried out using potato dextrose agar media. A total number of five fungi were isolated *Aspergillus niger*, *Aspergillus fumigatus*, *Aspergillus oryzae*, *Rhizopus oryzae* and *Rhizopus stolonifer*. *Aspergillus fumigatus* and *Aspergillus niger* had the highest percentage frequency of occurrences of 33.33%, *Rhizopus oryzae* and *Rhizopus stolonifer* had the lowest percentage frequency of occurrence of 6.67% respectively. Conclusively the amount of work already accomplished in the investigating the micro flora of the soil it must be admitted that no one has yet been able to give a clear picture of all life in the soil and of all interaction of different groups of living things. Developing novel methodologies to study soil ecology under the natural condition in wheat fields is needed and will required collaboration between plant biologists, ecologists, and soil scientist to develop the a system where biochemical and molecular biology studies could be performed on site. It has been estimated that one gram of surface soil contain 50,000 to a million fungi, the loss of organic material from root provides the energy for the development of active fungal population in the Rhizosphere around the root of wheat crop.

Wheat (*Triticum aestivum*) crop field in Kota

Methodology

The soil samples from wheat fields of Kota region were introduced into a test tube containing 9ml of sterile distilled water. Suspension prepared was labeled and vigorously shaken. Serial dilution was prepared by pippeting 1ml from stock suspension and inoculates in to 9ml of sterile distilled water in a labeled test tubes and shaking vigorously to obtain 10^{-9} dilution 1ml was further pipette from the first dilution and introduced in to another labeled test tube to obtain 10^{-1} dilution. They were repeated done to obtain up to 10^{-9} dilution

0.1ml each from 10^{-4} and 10^{-5} dilutions were inoculated in PDA plates and swabbed to ensure even distribution of inoculums in the medium. Also 0.5ml each was taken directly from the stock suspension and inoculated into PDA agar plate and swabbed as above. All plate were labeled and incubated at room temperatures for 5 to 6 days. After incubation the fungal colonies will be developed

Fully developed colonies with different cultural characteristic were subculture using sterile inoculating needles in to freshly prepared PDA plates. Each colony was considered to have originated from one fungal propagules Sub cultured plates were incubated at room temperatures for 3–5 days to obtain pure cultures of the various fungal types.

Fungal colonies in petriplates

Placing a drop of fungal stain using mounting needle on the clean slide and carefully teased (spread). A drop of lacto phenol cotton blue was added on fungal stain and cover slip was placed on top. Then, examine under microscope using x40 objectives The fungi were identified by way of microscopic method

Pure fungal cultures in test tubes

Discussion and Results

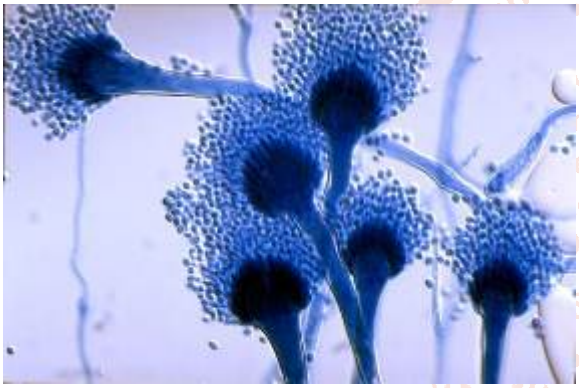
The fungal species isolated and identified are described in table below:-

Table-1: Morphological and Cultural Characteristic of the Isolated Fungi

Fungal Isolate	Colony Texture
Aspergillus niger	Colonies consisting of a compact white yellowish with dense of dark brown to black.
Aspergillus fumigatus	Colonies consisting of a dense felt of dark green conidiophores intermixed with aerial hyphae
Rhizopus stolonifer	Colonies whitish becoming-greenish due to the brownish sporangiosphores and brown black sporangia.
Rhizopus oryzae	Colony whitish becoming-gray with age, about 10mm high. Stolons smooth or slightly rough almost colorless almost too yellowish brown.
Aspergillus oryzae	Colonies consisting of a felt of long conidiophores often intermixed with aerial mycelium. Pale greenish yellow, later becoming light to dull brown.

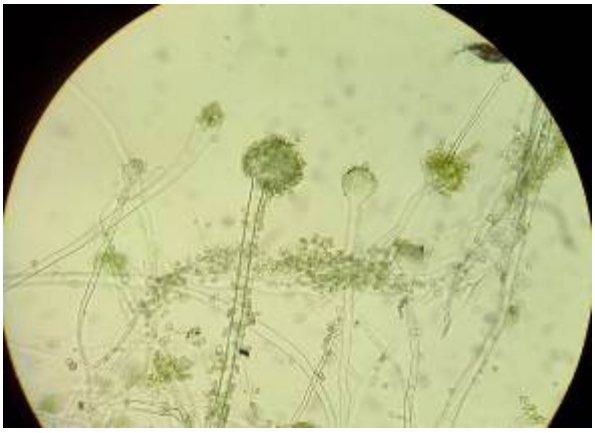
Aspergillus niger

Hyphae are septate and hyaline. Conidial heads are radiate initially, splitting into columns at maturity. The species is biseriate (vesicles produces sterile cells known as metulae that support the conidiogenous phialides). Conidiophores are long (400-3000 µm), smooth, and hyaline, becoming darker at the apex and terminating in a globose vesicle (30-75 µm in diameter). Metulae and phialides cover the entire vesicle. Conidia are brown to black, very rough, globose, and measure 4-5 µm in diameter



Aspergillus fumigatus

Aspergillus colonies are downy to powdery in texture. The surface color may vary depending on the species. The reverse is uncolored to pale yellow in most of the isolates. *Aspergillus fumigatus* is a thermotolerant fungus and grows well at temperatures over 40°C. This property is unique to *Aspergillus fumigatus* among the *Aspergillus* species. *Aspergillus fumigatus* can grow at a temperature range of 20 to 50 °C.



Aspergillus oryzae

Other microscopic structures include sclerotia, cleistothecia, aleuriconidia, and Hulle cells. These structures are of key importance in identification of some *Aspergillus* species. Cleistothecium is a round, closed structure enclosing the asci which carry the ascospores. The asci are spread to the surrounding when the cleistothecium bursts. Cleistothecium is produced during the sexual reproduction stage of some *Aspergillus* species. Aleuriconidium is a type of conidium produced by lysis of the cell that supports it. The base is usually truncate and carries remnants of the lysed supporting cell. These remnants form annular frills at its base. Hulle cell is a large sterile cell bearing a small lumen. Similar to cleistothecium, it is associated with the sexual stage of some *Aspergillus* species.

Rhizopus oryzae

Some morphological features, such as the length of rhizoids and sporangiophores, the diameter of sporangia, the shape of columellae, and the size, shape and surface texture of sporangiospores aid in differentiation of *Rhizopus* species from each other.

Rhizopus stolonifer

Nonseptate or sparsely septate broad hyphae (6-15 µm in diameter), sporangiophores, rhizoids (root-like hyphae), sporangia, and sporangiospores are visualized. Sporangiophores are brown in color and usually unbranched. They can be solitary or form clusters. Rhizoids are located at the point where the stolons and sporangiophores meet. Sporangia (40-350 µm in diameter) are located at the tip of the sporangiophores. They are round with flattened bases.

Apophysis is absent or rarely apparent and columellae are hemispherical. Sporangiospores (4-11 µm in diameter) are unicellular, round to ovoid in shape, hyaline to brown in color, and smooth or striated in texture

Table 2 Frequency of Occurrences of the Isolated Fungi

Fungal Isolate	Number of Occurrences
Aspergillus niger	5
Aspergillus fumigatus	5
Aspergillus oryzae	3
Rhizopus oryzae	1
Rhizopus stolonifer	1
TOTAL	15

Table 3 Percentage Frequency of Occurrences of the Isolated Fungi

Fungal Isolate	Percentage of occurrences (%)
Aspergillus fumigatus	33.33%
Aspergillus niger	33.33%
Aspergillus oryzae	20.00%
Rhizopus oryzae	6.67%
Rhizopus stolonifer	6.67%
Total Percentage	100%

The result obtained in this research indicated that *Aspergillus fumigatus* and *Aspergillus niger* has the higher percentages and high number of occurrences. The highest number of fungal species isolated from the rhizosphere of wheat crop is not surprising, due to the production of substrate by growing root in the form of root exudates containing amino, sugar, organic acid, nucleotide and other substrate. Thus, this lead to their proximity to the roots and subsequent proliferation and multiplication of the mycoflora in the soil region. Also high rate of microbial decomposition of both organic and sloughed off tissue (wheat) is yet another factor of their abundance compared with the field soil where such activities are minimal.

The fungal flora acts as universal agent of decay, from which new life continually arises and is nourished, the fungi makes a unique contribution to the maintenance of soil fertility. Apart from the saprophytic fungi which act as scavengers, a number of important plant parasitic fungi live in the soil and attack economically, important plants through their roots or at the ground level. The obligate saprophytic fungi isolated were genera of *Aspergillus* which affect the wheat crop only when they are kept during storage period. Also they add to the total biomass of fungi in the soil and advantageous in the decomposition of organic matter which enhances soil fertility. It was also noted that, the intense microbial activity in the soil (i.e. from both harmful and beneficial microbes) can be especially important because it may result in suppression or even elimination of photogenic microorganism. *Rhizopus oryzae* affects the wheat plants rottening it.

Conclusion

The result of this study indicated that five fungal isolate where isolated which include the *Aspergillus niger, Aspergillus fumigatus, Aspergillus oryzae, Rhizopus oryzae* and *Rhizopus stolonifer*, which indicate that out of these fungal isolate *Aspergillus niger* and *Aspergillus fumigatus* has the higher percentage frequency of occurrence of 33.33%, followed by *Aspergillus oryzae* which has 20.00%, while the *Rhizopus oryzae* and *Rhizopus stolonifer* has the least percentage frequency of occurrence of 6.67% respectively. Thus it can be understood that fungi are also necessary evils. They can be bound in rhizosphere of crop and create fertility in field and can also simultaneously be parasitic to wheat plants. Hence useful fungi should be added to the field and conservation should be done whereas harmful parasitic fungi destroying crops should be treated using antifungals of specific types. Mycoflora in fields of wheat or any crop thus in general decay and make soil fertile making growth and development of plants more effective and in high frequency of fungal species the rate of growth of crops also increases.

Hence positive utilities of mycoflora in soil makes farmers to add good saprophytic decaying species in fields in Kota region

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